

Understanding Uncertainty in the Malt Lab - The key to process and quality control

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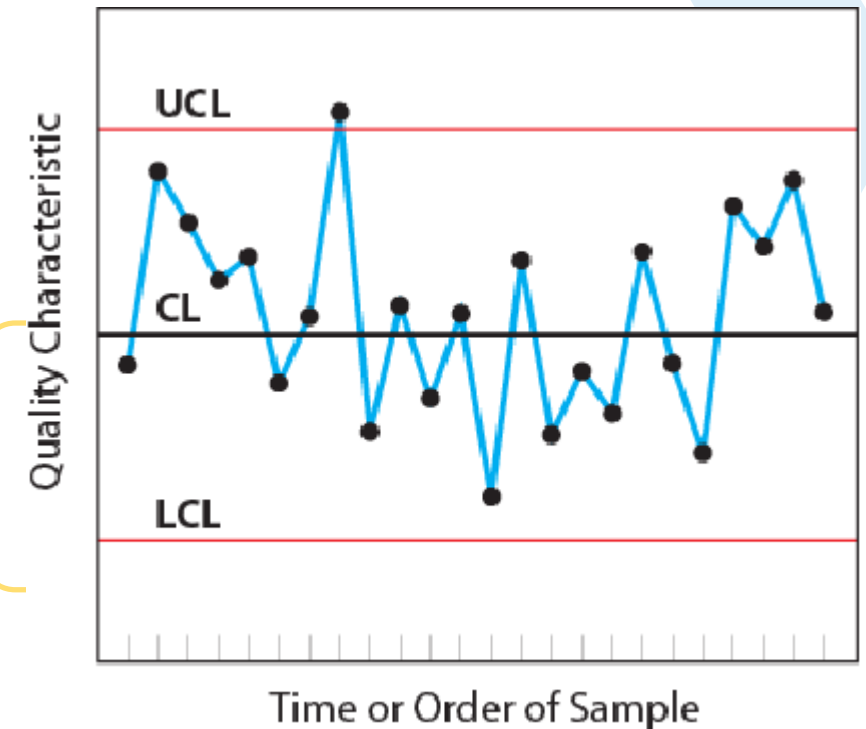


› The fallacy of infinite precision

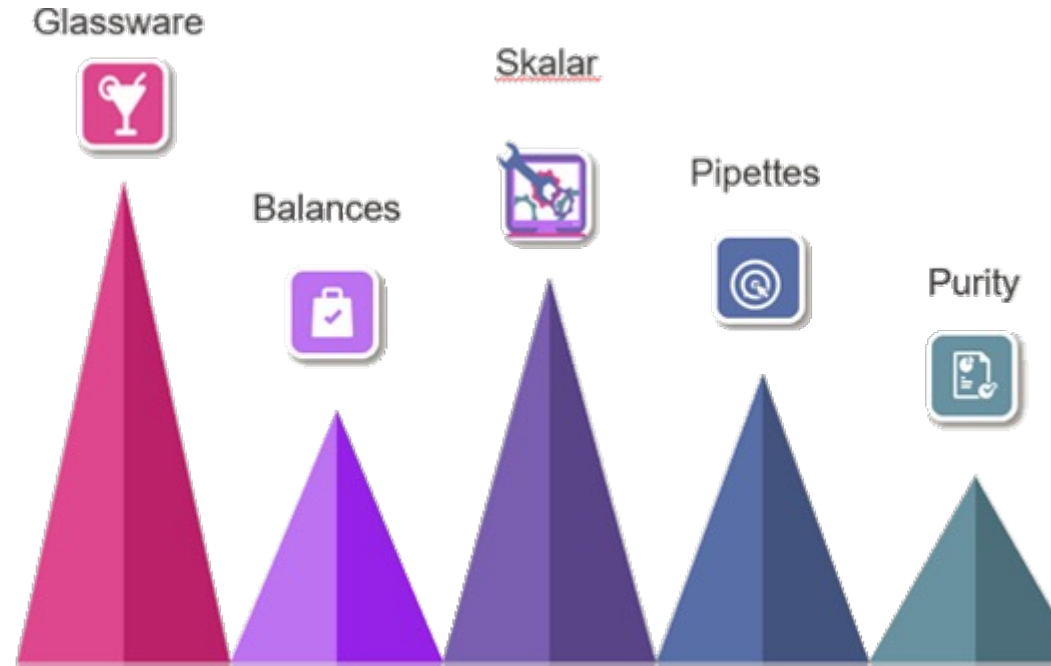
The true value of a measurement is not (precisely) known

A result is not a single number, it is a *range* of numbers.

That range is defined by the uncertainty (aka variability or “error” of the test).



Sources of uncertainty



There are many sources of uncertainty.
They can only be effectively controlled (and variability reduced) if they
are identified and understood

Overall uncertainty calculation

STEP 1

- Specify measurand: what are we measuring?
- Isolate every target analyte

STEP 2

- Identify potential sources of uncertainty
- Review each step of the Standard Operating Procedure (SOP)

STEP 3

- Quantify uncertainty from each different source (U_x)
 - Type A : directly from lab (e.g., replicates and duplicates)
 - Type B : from other sources (e.g., certificates of calibration)

STEP 4

- Calculate combined standard uncertainty
- Calculate significance of each contributing factor, comparing to the largest U_y . If U_y is less than 1/3 of overall U , it is considered non-significant



Prepare a template and use for many parameters!

What does the knowledge of MU provide?

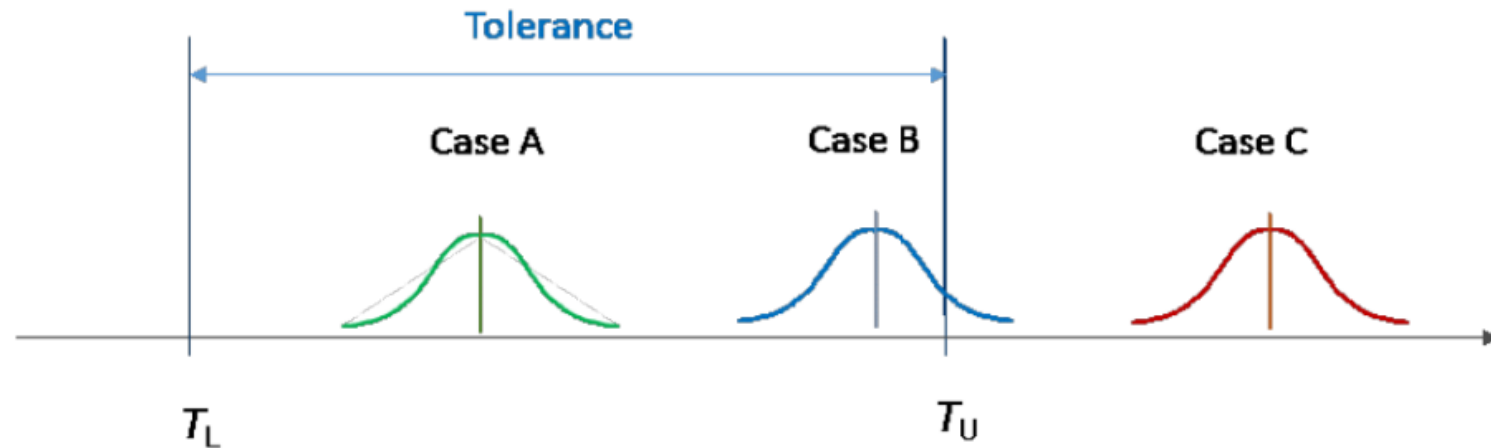
Lab internal quality control

- Is the method in control?
- What is the expected variation between a replicate?
 - Realistic expectations
 - Effective QC of results
 - Effective inter-lab comparison
 - Effective comparison with proficiency testing results

Customer trust

- More than a single number
 - Better operational decisions – looking beyond the retest!
 - Accurate reporting on COAs

Statistically in control and statistically in spec



Lab results have uncertainty attached to them, and thus it should be part of the QC decision making

Probabilistic approach: Use MU to build guard bands





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